1. Major Changes
2. Revisions Required in The Summary Review
3. Create better scenarios
   1. [R4] The video illustrated a rather simple star-substructure network, but that would necessarily require such complicated setup but simply a degree calculation. A more interesting use case would have helped a lot.
4. Improve supplementary material
   1. [R2] The video would greatly improve with narration, and an intro.
   2. [R3] The supplementary material should contain a voice-over for publication.
   3. [R4] The supplemental material, the video, seems to be accelerated and it is not clear if the querying and results are real-time or not.
5. Improve discussion
   1. [R1] While the workflow intuitively makes sense, further discussions about the theoretical guarantees ensuring a good exemplar being suggested is required. It fairly seems like a completely automated approach, however, there seems to be manual tuning like, "a connected component is filtered out automatically if its size is too small (|C|/|gs| < 50%) or it cannot be mapped to the exemplar properly (|PC|/|Ps| < 50%)."
   2. [R2] Can this method be extended to dynamic networks (i.e., networks that change over time), what would be the implications? The network sketching would be different, the overall network visualization etc. what else would change, and do you think this can be done such that it is still this interactive and intuitive?
   3. [R2] Why is the method limited to networks that are undirected and do not contain any self-loops and multiple edges? Is this a limitation of the matching algorithm? Are there algorithms that can deal with less constraints? What would be the performance hit?
   4. [R2] I think the paper benefits from describing in more detail how the exemplar is specified. Is this really done node by node, edge by edge, or is the user enabled to also define more abstract concepts e.g., give me two dense clusters connected by 2 edges. Or give me all structures where a large dense cluster (> 100 nodes) is connected with two smaller dense clusters (<= 50 nodes).
   5. [R2] The method demands that the networks is translated to vectors. It seems this is already pre-computed as stated in section 6. This is no hinderance for the method but it would be good to explain how this is done and how much time it takes for the example bitcoin network given.
   6. [R4] The discussion section barely talks about the design tradeoffs, implications, value, etc. It is very short and requires significant elaboration.
6. Include missing work
   1. [R1] The authors mention several works in the related work. However, other major works on the visualizations seem to be missing, some of these include, Purchase, Helen C., Eve Hoggan, and Carsten Görg. "How important is the “mental map”?–an empirical investigation of a dynamic graph layout algorithm." International Symposium on Graph Drawing. Springer, Berlin, Heidelberg, 2006.

Ma, Kwan-Liu, and Chris W. Muelder. "Large-scale graph visualization and analytics." Computer 46.7 (2013): 39-46.

* 1. [R3] The related work is very broad and should be more specific to the problem the paper addresses. There are just too many graph visualizations out there at the moment, and few addressing the problem of subgraph matching. Rather than listing many of them, the related work should carve out the problem with existing approaches to support the main motivation in the paper. Can you tell us more about related automatic approaches based on e.g. subgraph similarity? See e.g. for an example:

- A System for Interactive Visual Analysis of Large Graphs Based on Motif Analysis T von Landesberger, M Görner, R Rehner, T Schreck - International Fall Workshop on Vision, Modeling, and …, 2010

1. Clarify ‘exemplar’
   1. [R1] The authors use the word "exemplar" a lot. It would be great to define this term earlier in the manuscript and not in page 3 of the manuscript
   2. [R2] I think the paper benefits from describing in more detail how the exemplar is specified. Is this really done node by node, edge by edge, or is the user enabled to also define more abstract concepts e.g., give me two dense clusters connected by 2 edges. Or give me all structures where a large dense cluster (> 100 nodes) is connected with two smaller dense clusters (<= 50 nodes).
   3. [R4] Section on Specifying Exemplars (4.2), a key component of exploring the network, is very short. Similarly, (5.3) provides almost no insight into this task.
2. Describe/discuss quality of exemplars
   1. [R1] Also, while the idea is great, it is hard to judge the quality of the suggested "exemplars". How useful are these exemplars? This definitely would vary for different graph types, for e.g., social networks, marketing networks. A brief description of the quality of the methodology would be great.
   2. [R3] A high-level question that remains to me is how you allow for control over how 'strict' the algorithm is in suggesting patterns. I.e. what control does a user has with respect to controlling a) what is similarity, and b) how similar the suggested structures should be. How do you decide how many 'similar' structures do you find and show? The video shows the interface components (sliders) but I think I could not find them in the paper.
3. Report on search speed
   1. [R4] Performance evaluation (6.2) is not clear. Since there are no extensive user studies, this section should have been much longer and elaborative. What other approaches could have been used?
4. Include index terms, below abstract
5. Other Revisions Required by Reviewers

[R1]

**Review: I still do not get the motivation of the work, the authors mention that the subgraph matching involves a lot of computational cost. While this is true, I am not sure if this work is aimed at solving this very particular problem the computational cost problem or the visual perceptual network exploration problem.**

Revision:

**Review: The authors do not mention about edge-cases in specifying the exemplars, how does the system handle exemplars when the user picks all nodes, or exemplar consisting of 60-70% of the graph network?**

**Review: Again, while the idea is good, insights are so much harder to gain from Figure 8 or all figures in general. The number of edge-crossings impedes meaningful interpretation of the data.**

[R2]

**Review: Did the authors do experiments with different network vectors? If so, what worked best, what didn't work etc.?**

**Review: As stated the users in the user study all had experience with visualization, but did they also have experience with network exploration (more important imho).**

**Review: - page 2, section 2.2: van Han -> van Ham**

**- Page 3, Section 4.1: what are networklets?**

[R3]

**Review: Can you explain 'vectorized' in the abstract a little better?**

**Review: From the intro, it is not clear how the contribution of this paper relates to the problem of NP-hardness of finding matching subgraphs. The intro talks about visualization but the problem addressed in this paper is about automatic suggestions of substructure. I think this problem and analytical solution must be highlighted better in the intro and in the related work (see below).**

**Review: Which specific problems do the 5 methods have that you list in Sec 4.1? Why do you need your contribution to amend them? Currently, at the end of the related work, I know that interactive approaches do not scale, but this is clear from the beginning.**

**Review: The motifs in Fig 1e are very small and I wonder why not more space have been dedicated to them? Fig. 7a on the other side is a vector illustration, probably done by hand. How do you show large subgraphs with many nodes?**

**Review: In the user study, some details are missing, e.g. how was time recorded if participants provided their answers on a separate sheet? How did the training function? Which structures did you ask participants to find and how complex have they been? Was there any balancing? how often did they have to find structures? how did you counteract any training effect in finding and learning structures?**

**Review: Second, I am not sure it is valid to compare human performance to automated approaches. I think the measure of success for this system is not time and precision, but how much the found structures resemble each other, compared to other automatic baseline approaches.**

[R4]

**Review: Networks are simple, undirected, unweighted. Many large networks are not necessarily like that.**

**Review: I realize that a user study is not critical, but visual exploration of networks ultimately demands an evaluation of how well user exploration is supported. (7) is very short and not as sophisticated as it should be. Either 6.2 should be better or 7.**

**Review: I realize that this is not a network visualization tool, but the clutter of the graphs could have been improved through better node/edge styling or some occlusion techniques. It would allow a clearer identification of substructures too.**

**Review: I do like the capability of providing graph suggestions as well as indication where in the graph they may be. However, I struggle with the scalability of this approach as I think there could many of these examples through the graph. For instance, what if I sketch a triad? Without any node information, we lose a lot of important information.**

**Review: The exploration history capability is definitely of value, but in the use case description it is unclear how this could be used. Is there an undo functionality? Could two different searches be saved and compared? Neither one of these are elaborated.**